Electrochemical deposition of Fe2O3 in the presence of organic additives: A route to enhanced photoactivity

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Supporting Information

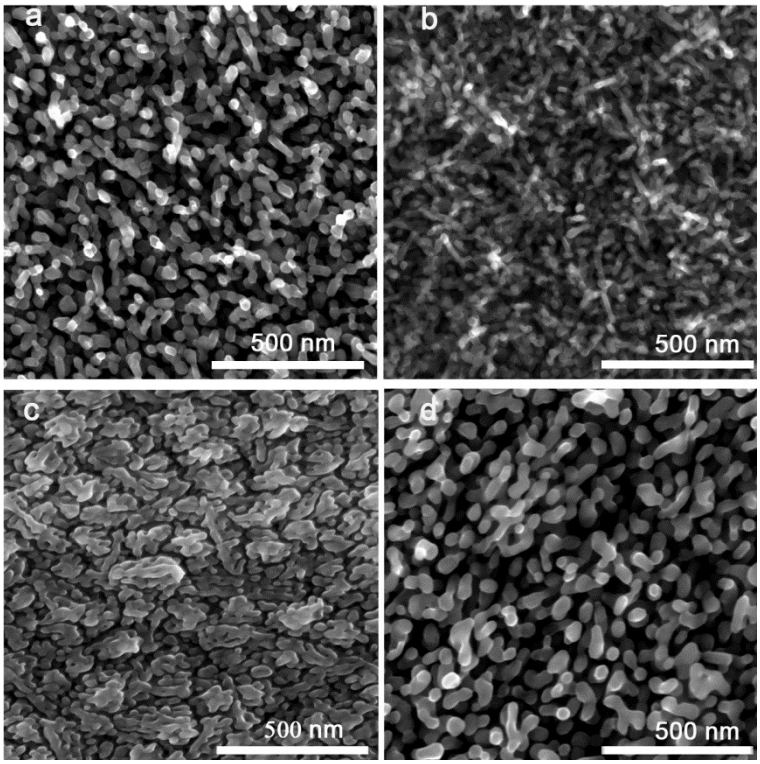

Figure 1S. SEM images of electrodeposited Fe_2O_3 films for 3min at 0.4 V vs Ag/AgCl and annealed at 600oC: (a) without (Fe_2O_3) and in the presence of (b) 1mM Sds (Fe_2O_3/Sds), (c) 1mM GA (Fe_2O_3/GA)), and (d) 1mM C343 (Fe_2O_3/C343). Showing the films are cark free and uniform all over.

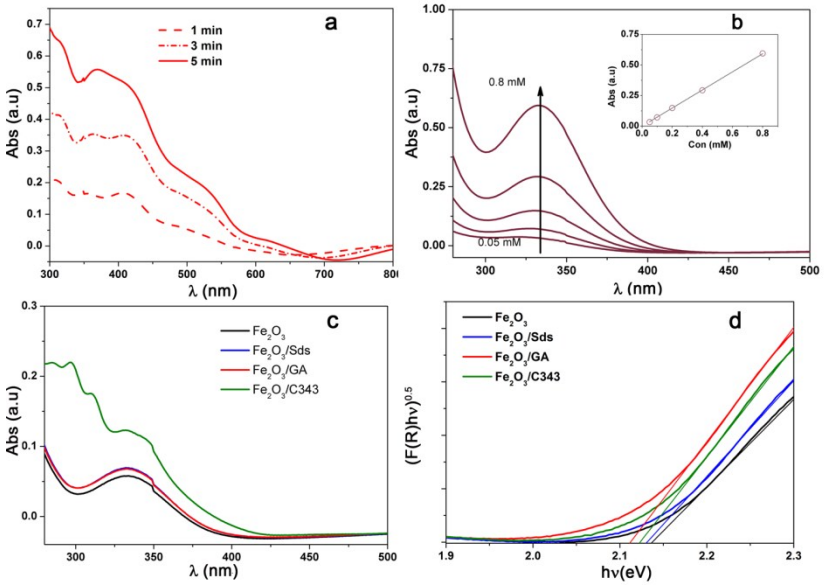

Figure 2S. (a) UV- Vis Spectra of annealed Fe_2O_3/GA films electrodeposited at 0.4 V vs Ag/AgCl at the specified deposition time, (b) UV- Vis Spectra of 0.05 mM- 0.8mM $FeCl_3$ solution in 2MHCl and inset the calibration curve, (c) UV- Vis Spectra of dissolved FeOOH films in 2MHCl showing the films contain similar amount of Fe^{3+} and the incorporation of C343, and (d) Tauc plot of hematite films showing the optical band gap is between 2.1-2.15 eV

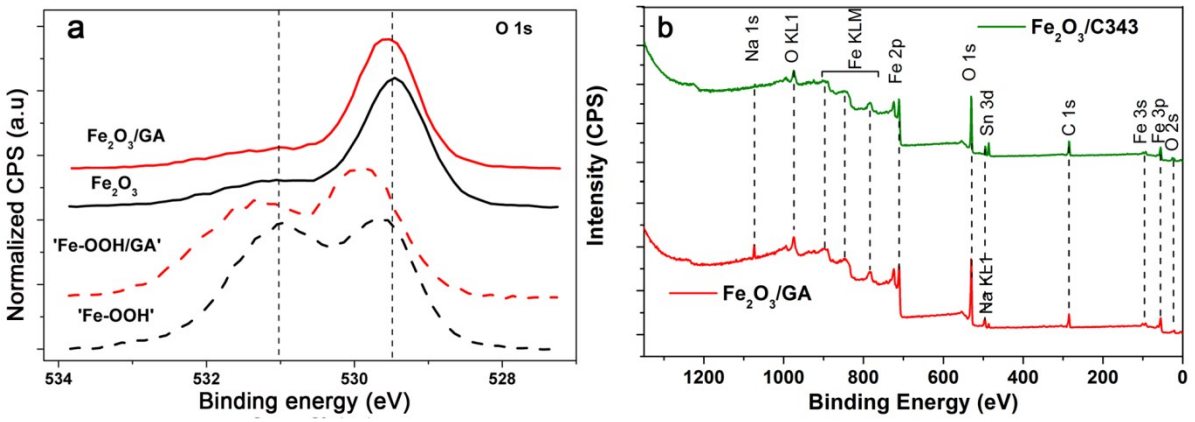

Figure 3S. (a) XPS spectra of Fe_2O_3 films electrodeposited without and with GA showing energy regions of O1s, (b) XPS survey spectra of Fe_2O_3 /GA and Fe_2O_3 /C343 showing the absence of N1s line.

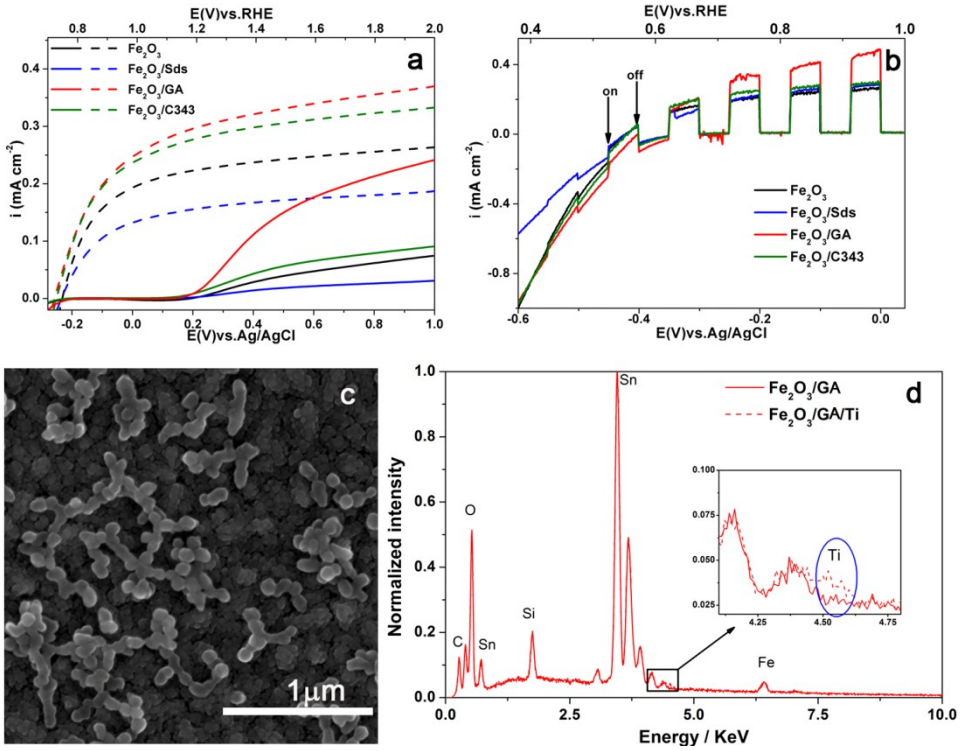

Figure 4S. (a) I-V curves of electrodeposited Fe2O3 in 1 M NaOH (solid line) and 1 M NaOH /0.5M H2O2 (dash line) under illumination, (b) chopped light voltammetry in 1 M NaOH /0.5M H2O2 showing the onset of the photocurrent, (c) SEM images of electrodeposited Fe2O3/GA films after Ti treatment. Islands of TiO2 nanoparticles are shown on top the hematite film, (d) EDXs spectra indicates the presence of Ti.

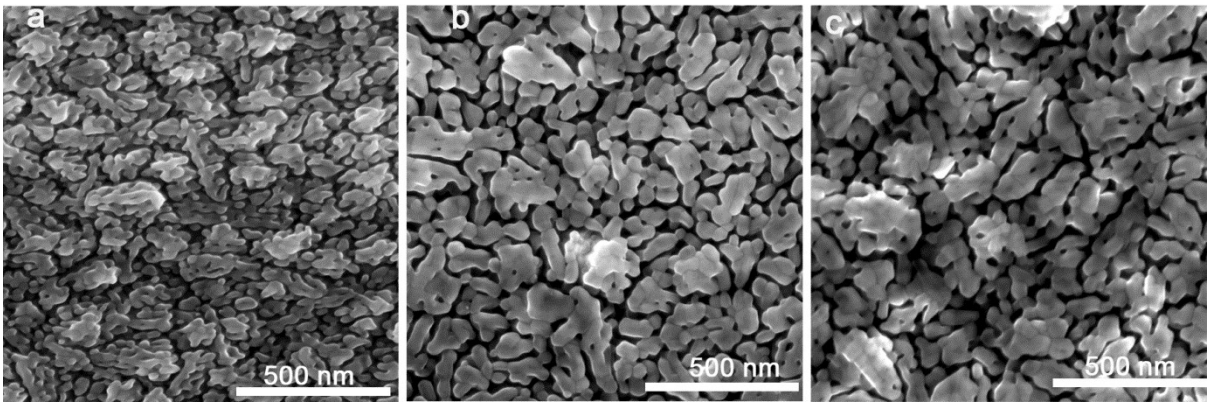

Figure 5S. SEM images of electrodeposited Fe_2O_3 films for 3min at 0.4 V vs Ag/AgCl and annealed at 600°Cand in the presence of (a) 1 mM GA, (b) 3 mM GA and (c) 6 mM GA.

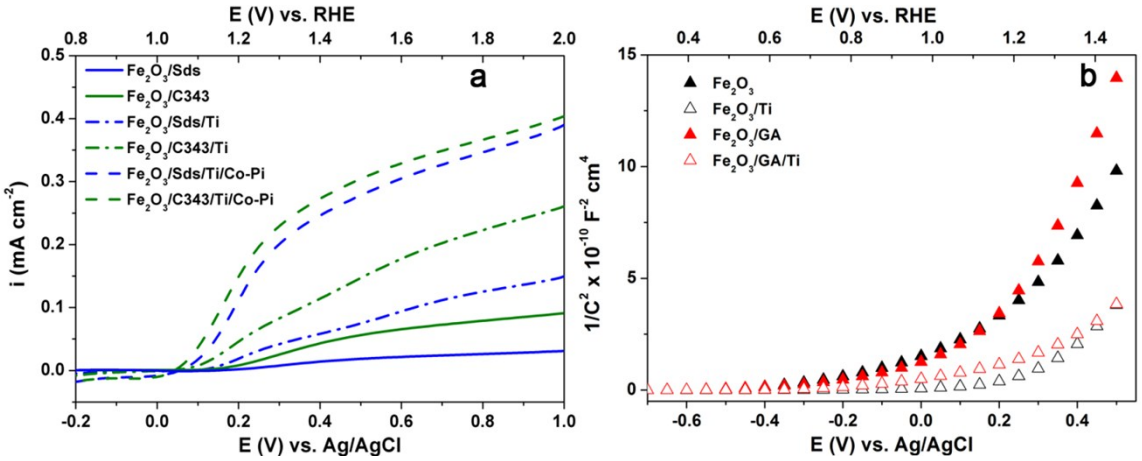

Figure 6S. (a) I-V curves for Ti and Co-Pi treated electrodeposited Fe_2O_3/Sds and Fe_2O_3/C343 films, (b) MS plot showing the effect of Ti, capacitance values are derived from EIS measurements at 1 kHz.

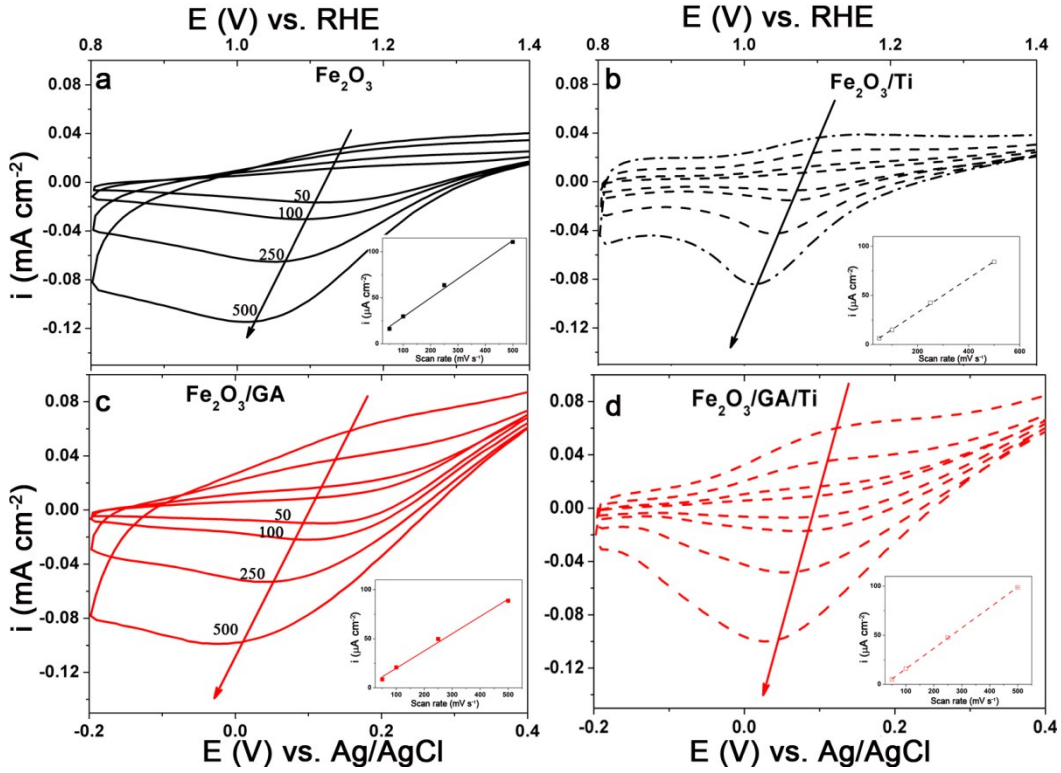

Figure 7S. Cyclic voltammograms of hematite films polarized for 60 sec at 1.8 V vs. RHE under illumination and cyclic voltammograms were recorded at different scan rate (50, 100, 250 and 500 mV s^{-1}) in the dark. (a) Fe_2O_3, (b) Fe_2O_3/Ti, (c) Fe_2O_3/GA, and (d) Fe_2O_3/GA/Ti. Insets show cathodic peak current versus scan rate and the corresponding linear fits